NEW SPECIES OF *ELEUTHERODACTYLUS* OF COLOMBIA (AMPHIBIA: LEPTODACTYLIDAE). I: FIVE NEW SPECIES FROM THE PARAMOS OF THE CORDILLERA CENTRAL

By

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SUMMARY

Eleutherodactylus obmutescens, *E. racemus*, and *E. simoterus* are new species of the *unistrigatus* Group named from the Páramo de Puracé, Páramo de las Hermosas and Páramo de Letras, respectively, in the Cordillera Central of Colombia. The new species are allied to *E. orcesi* Lynch and *E. thymelensis* Lynch known from páramos primarily on the Cordillera Occidental of Ecuador.

Eleutherodactylus leptolophus and *E. peraticus* are new species of the *unistrigatus* Group named from the Páramo de Puracé and Páramo de las Hermosas, respectively. These are diminutive frogs most closely related to *E. myersi* (Goin and Cochran) from the Nudo de Pasto and to *E. trepidotus* Lynch from the subpáramos of the eastern versant of the Cordillera Oriental of Ecuador.

The five new species with *E. buckleyi* (Boulenger) comprise the six species of *Eleutherodactylus* now known to inhabit páramos in the Cordillera Central of Colombia.

RESUMEN

Se describen aquí las nuevas especies *Eleutherodactylus obmutescens*, *E. racemus* y *E. simoterus*, del grupo *unistrigatus*, provenientes de los Páramos de Puracé, Las Hermosas y Letras, respectivamente, en la Cordillera Central

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de Colombia. Estas especies son afines a *E. orcesi* Lynch y *E. thymelensis* Lynch, conocidas principalmente de páramos en la Cordillera Occidental del Ecuador.

Se describen además *Eleutherodactylus leptolophus* y *E. peraticus,* también del grupo *unistrigatus,* provenientes de los páramos de Puracé y Las Hermosas, respectivamente. Estas son ranas diminutas, muy estrechamente relacionadas con *E. myersi* (Goin & Cochran) del Nudo de Pasto, y con *E. trepidotus* Lynch de los subpáramos de la vertiente oriental de la Cordillera Oriental del Ecuador.

Las cinco especies nuevas representan, junto con *E. buckleyi* (Boulenger), las seis especies de *Eleutherodactylus* conocidas hasta ahora de los páramos de la Cordillera Central de Colombia.

INTRODUCTION

Cochran and Goin (1970) recognized only 33 species of *Eleutherodactylus* as part of the anuran fauna of Colombia. Collections made by William E. Duellman, Pedro M. Ruiz and Philip Silverstone between 1966 and the present document the occurrence of more than 100 species of *Eleutherodactylus* in Colombia. At present, few areas of Colombia have been adequately explored in terms of the eleutherodactyline frog fauna (the best-known areas include the chocoan lowlands and the Sierra Nevada de Santa Marta).

The high-altitude fauna of the Cordillera Central is especially poorly-known. Cochran and Goin (1970) reported only *Eleutherodactylus lehmanni* and *Trachycephalus myersi* (considered an *Eleutherodactylus* by Lynch, 1968) from the Nudo de Pasto and nothing from the vast expanse of mountains to the north. The purpose of this paper is to describe five new species of *Eleutherodactylus* found in páramos on the Cordillera Central of Colombia.

METHODS AND MATERIALS

Measurements were taken with dial calipers to the nearest 0.1 mm. The following measurements were taken (when possible):

SVL (snout-vent lenght) — tip of snout to anal opening.

Shank length — recorded when leg is flexed, as shortest length of tibiofibula (plus tissue covering end of bones).

HW (head width) — greatest breadth of head measured across jaws.

Head length — an estimate of the distance (along the sagittal plane) between tip of the snout and a line between the posterior corners of the jaws. Not the chord of the maxillary arch.

Eyelid width — breadth of upper eyelid, perpendicular to lateral margin of eyelid.

IOD (interorbital distance) — shortest distance between upper eyelids.

Tympanum — length (horizontal) of tympanic annulus, measured from center of annulus.

Eye length — greatest length of eye.

E-N (eye to nostril distance) — distance between posterior edge of nostril and anterior edge of eye.

Unless stated otherwise, all measurements and ratios are based on adults. Maturity in females was assumed if the oviducts were enlarged and strongly convoluted (most also have enlarged ova). Females having narrow oviducts with only slight evidence of convolution have only small eggs (less than 0.5 mm in diameter) and are termed "young". Females with straight, very narrow oviducts are "juveniles". In males, maturity was assumed if the testes were enlarged and swollen. In some species, additional evidence of maturity is available by observing vocal slits on the floor of the mouth and/or the presence of nonspinous (usually white and glandular) nuptial pads on the thumbs (also usually swollen).

The diagnoses consist of 14 numbered statements (or groups of statements) following the system used for the past decade and then a paragraph wherein I offer an opinion as to what species the new species is most similar (and related) and how the species can be differentiated.

Throughout the text, specimens are identified by museum number and an acronym for the collection (as follows):

AMNH — American Museum of Natural History, New York.

ICN — Instituto Ciencias Naturales, Museo de Historia Natural, Universidad Nacional de Colombia, Bogotá.

INDERENA — División de Parques Nacionales y Vida Silvestre, Bogotá.

KU — Museum of Natural History, The University of Kansas, Lawrence.

UMMZ — University of Michigan Museum of Zoology, Ann Arbor.

UVMP — Museo de Parasitología, Universidad del Valle, Cali.

SPECIES ALLIED TO *ELEUTHERODACTYLUS ORCESI* AND *E. THYMELENSIS*

Eleutherodactylus buckleyi (Boulenger) is a common frog distributed from norther Ecuador into the Nudo de Pasto and northward onto the Cordillera Central (Lynch, MS). It has small digital pads, frontoparietal crests, and the tympanum is visible (Fig. 1). On the Páramo de Puracé it is sympatric with a smaller frog having larger digital pads and having the tympanum concealed beneath the skin on the side of the head. The new species is known only from the Páramo de Puracé.

Eleutherodactylus obmutescens sp. nov.

Holotype. Adult ♀, ICN (Colección Batracológica) No. 2087, collected by Pedro M. Ruiz-C., 22 July 1975.

Paratypes. ICN 2085, 2089, adult ♂♂; same data as holotype. KU 144086-106, collected on the Páramo de Puracé, Depto. Cauca, Colombia, 3.200 m alt.

Type locality. Páramo de Puracé, alrededores de la Laguna San Rafael. Departamento del Cauca, Colombia, 3.400 m.

Etymology. The specific epithet is Latin, meaning keeping silent in allusion to the lack of a voice in this species (inferred from lack of vocal slits or sac and the thick skin covering the tympanum).

Diagnosis. (1) skin of dorsum bearing large flat warts (especially posteriorly), that of venter coarsely areolate; no dorsolateral folds; paravertebral folds indistinct; (2) tympanum concealed beneath skin; (3) snout short, round in dorsal and lateral profiles (Fig. 1); (4) IOD wider than upper eyelid; low cranial crests in adult females; frontoparietal fontanelle not exposed; (5) vomerine odontophores prominent, oblique; (6) males lacking vocal slits and vocal sac; no nuptial pad (or swelling) on thumb; (7) first finger shorter than second; digital pads small (Fig. 2), bearing broad discs; (8) fingers bearing thick, fleshy lateral fringes; (9) ulnar tubercles indistinct; (10) small, non-conical tubercles on heel and outer edge of tarsus; no inner tarsal tubercles; (11) two metatarsal tubercles, inner oval, 3-4 times size of round outer; numerous low supernumerary plantar tubercles present; (12) toes bear lateral fringes, not webbed; (13) dark brown above, usually with no markings, becoming rusty brown on flanks, groin, anterior and posterior surfaces of thighs; posterior surfaces of thighs sometimes with cream spots; venter cream with reddish-brown reticulations to uniform gray; (14) adults moderate-sized, males 21.4-26.6 ($\bar{x} = 23.9$, $N = 14$) mm SVL, females 28.5-38.4 ($\bar{x} = 32.6$, $N = 12$) mm SVL.

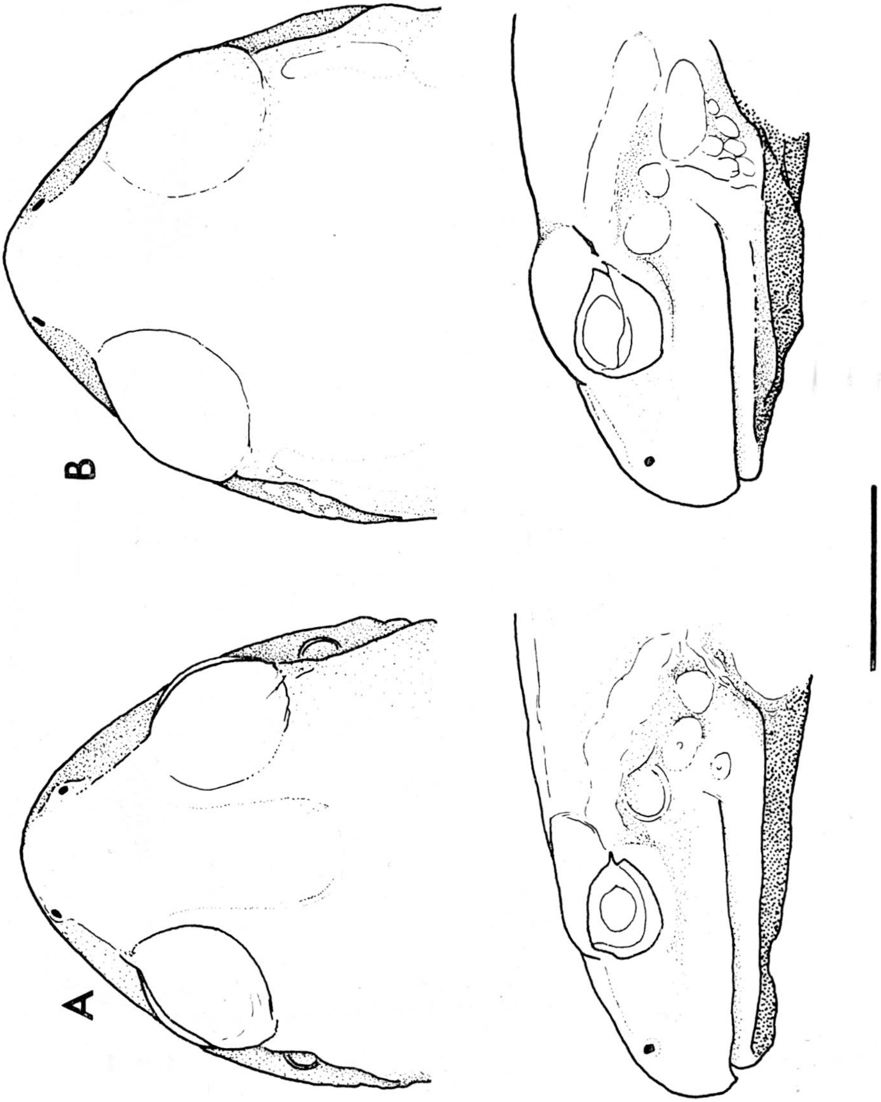

FIGURE 1. Dorsal and lateral views of heads of (A) *Eleutherodactylus buckleyi*, KU 144111, and (B) *E. obmutescens* sp. nov., KU 144095. Line equals 5 mm.

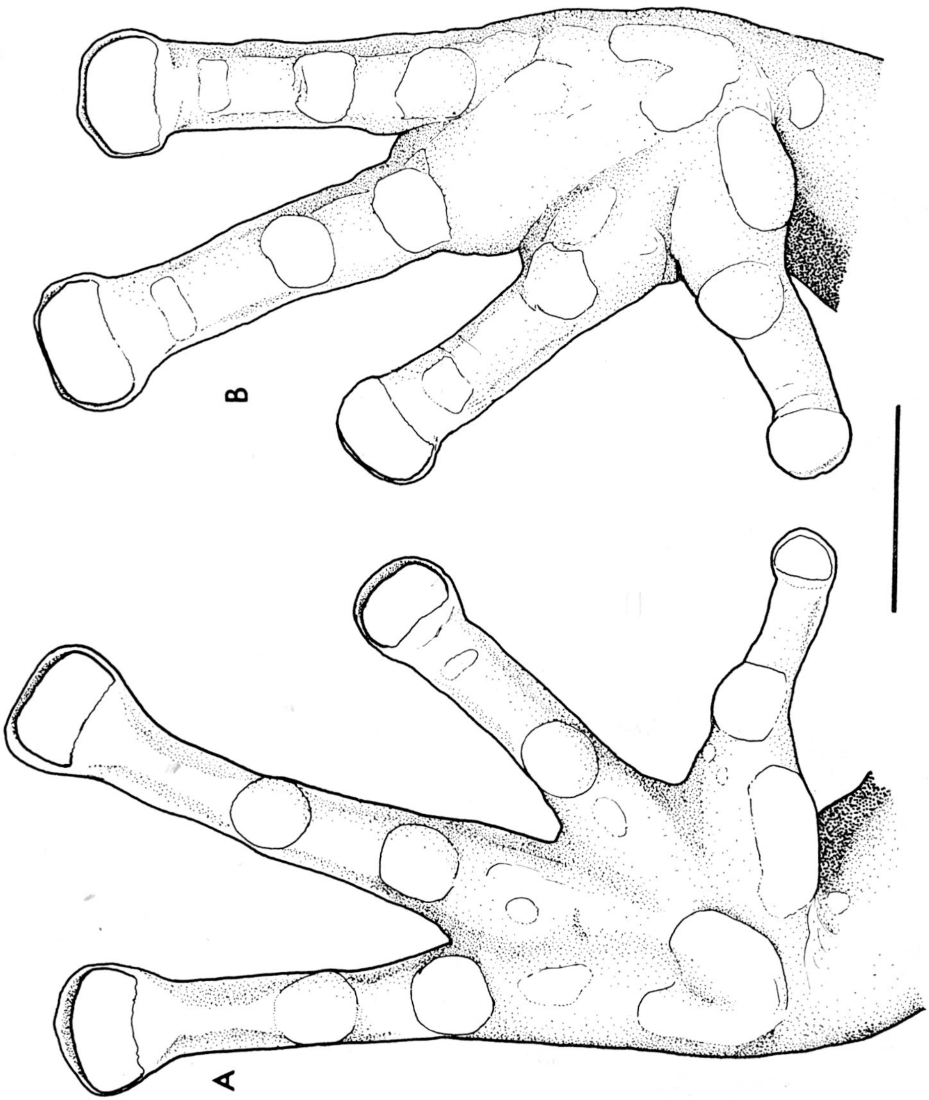

FIGURE 2. Hands of (A) *Eleutherodactylus buckleyi* (UMMZ IJ 5988) and (B) *E. obmutescens* sp. nov. (KU 144095). Line equals 3 mm.

Eleutherodactylus obmutescens is most similar to *E. thymelensis* Lynch named from the Páramo del Angel in northern Ecuador (Lynch, 1972) but differs in lacking vocal sac and slits, in having the frontoparietal fontanelle covered by bone, in having a larger outer metatarsal tubercle, and in lacking canthal-supratympanic stripes.

DESCRIPTION. Head narrower than body, broader than long; snout rounded (or weakly subacuminate) in dorsal view, round in lateral profile; snout short; nostrils not or very weakly protuberant; canthus rostralis sharp, concave; loreal region concave, sloping abruptly to lips; interorbital region flat, no cranial crests, broader than upper eyelid; temporal region swollen; supratympanic fold thick, glandular; tympanum concealed, skin covering tympanum sunken; choanae minute, round, not concealed by palatal shelf of maxillary arch; vomerine odontophores low, oblique, between and posterior to choanae, broadly separated, bearing 2-4 teeth in an oblique row; tongue twice as long as broad, posterior border shallowly notched, posterior 2/5 not adherent to floor of mouth; males lacking vocal sac and slits.

Skin of dorsum bearing flattened warts; warts sparse on head and anterior back; no enlarged tubercles on head; no dorsolateral folds; anal opening lacking sheath; flanks bearing large flattened warts; skin of venter coarsely areolate; discoidal folds prominent; limbs lacking large warts on upper surfaces; posterior and ventral surfaces of thighs areolate; low warts along outer edge of forearm; palmar tubercle bifid, much larger than oval thenar tubercle; palmar supernumerary tubercles low, numerous; subarticular tubercles low, flattened, round to broader than long; fingers bearing ill-defined lateral fringes; all fingers bearing discs (broader than long) on weakly dilated pads; pads rounded apically; first finger shorter than second.

Knee, heel and tarsus lacking distinct tubercles or folds; inner metatarsal tubercle large, slightly longer than wide; outer metatarsal tubercle round, ¼ size of inner; plantar surface bearing some indistinct supernumerary tubercles; subarticular tubercles round, non-conical, simple; toes bearing lateral fringes, not webbed at base; all toes bearing discs (broader than long) on weakly dilated pads; pads rounded apically; when flexed hind legs are held at right angles to sagittal plane, heels overlap; heel of adpressed hind leg reaches to just posterior to eye or to middle of eye.

In preservative, dorsum brown to dark brown with or without yet darker brown blotches; dorsal coloration becoming reddish brown on concealed surfaces of thighs, shanks, and lower flanks; throat dull gray-brown; venter cream, heavily reticulated and flecked with rusty-brown; inner digits cream; no facial or limb markings. Some individuals have uniformly gray venter.

Other have pale spots on the concealed surfaces of the thighs. The least common variant is brown with cream spots on all body surfaces (e.g., ICN 2089).

Dimensions of holotype in mm: SVL 31.9; shank 14.6; HW 12.1; head length 10.7; upper eyelid width 3.5; IOD 3.7; eye length 4.0; E-N 2.9.

Proportions (as percentages) are as follows: ♂♂ (N = 14) shank/SVL 40.5-49.1 ($\bar{x}$ = 45.1), HW/SVL 34.8-38.6 ($\bar{x}$ = 36.6), eyelid/IOD 76.9-100.0 ($\bar{x}$ = 87.1), E-N/eye length 58.3-88.0 ($\bar{x}$ = 71.0); ♀♀ (N = 12) shank/SVL 43.4-49.5 ($\bar{x}$ = 46.7), HW/SVL 35.8-41.0 ($\bar{x}$ = 38.7), eyelid/IOD 80.6-100.0 ($\bar{x}$ = 90.4), E-N/eye length 65.1-96.8 ($\bar{x}$ = 80.9).

REMARKS. *Eleutherodactylus thymelensis* remains an uncommon frog. In addition to the specimens reported by Lynch (1972), I have seen only four other specimens. Duellman obtained one individual from the Páramo del Angel near the type-locality in 1975. I captured another individual (KU 177860) on the Paso de Guamaní in Provincia Pichincha, Ecuador, 3.860 m, in 1977. The only known specimens from Colombia are UVMP 2865-66 from lado norte del Volcán Galeras, Municipio de Pasto, Departamento de Nariño, Colombia; 3.310 m alt. With the exception of the record from Provincia Pichincha, Ecuador, all the known localities lie essentially on the Nudo de Pasto. One hundred and fifty kilometers to the northeast on the Cordillera Central we encounter only *E. obmutescens*. The two species are viewed by me as vicars. *Eleutherodactylus buckleyi*, from the Páramo de Puracé, has the following body size: ♂♂ 24.5-38.7 ($\bar{x}$ = 32.9, N = 22) mm SVL, ♀♀ 39.9-42.1 (N = 2) mm SVL. *Eleutherodactylus thymelensis* is the same size (♂♂ 21.4-25.2 [$\bar{x}$ = 23.6, N = 18], ♀♀ 28.0-33.5 [$\bar{x}$ =31.1, N = 7] mm SVL) as *E. obmutescens*.

DISTRIBUTION. Known only from the Páramo de Puracé, southeast of Popayán. In addition to the holotype and paratypes (listed above), I have examined the following (all from Departamento del Cauca): KU 145023-29, 145031-32, Puracé, 3.400 m (probably equals the type-locality); KU 169017, 17 km E Puracé, 3.300 m; KU 169018, Río Cocuy, 18 km E Puracé, 3.320 m; KU 169020, 169022-26, 23 km E Puracé, 3.275 m.

One hundred and seventy kilometers NNE of the type-locality of *E. obmutescens* another road reaches the crest of the Cordillera Central in the Páramo de Las Hermosas (NE of Tenerife, Depto. Valle del Cauca).

Eleutherodactylus racemus sp. nov.

HOLOTYPE. Adult ♀, KU 168960, one of a series collected by William E. Duellman, Dana K. Duellman and John E. Simmons, 4 June 1975.

Paratypes. INDERENA No. 46 (4 individuals), KU 168961-93; same data as holotype. KU 168940-41, 15 km NE Tenerife, Departamento del Valle del Cauca, Colombia, 3.460 m alt. KU 168942-59, 16.5 km Tenerife, Depto. Valle del Cauca, Colombia, 3.520 m alt. UMMZ CFW 4092, 3.7 km E Tenerife, Depto. Valle del Cauca, Colombia, 10.000 feet alt.

Type locality. Páramo de Las Hermosas, 18.0 km NE Tenerife, along frontier between Departamentos del Valle del Cauca and Tolima, 3.570 m alt.

Etymology. The specific epithet is Latin, meaning a bunch of berries, in allusion to the warty skin (Fig. 3).

Diagnosis. (1) Skin of flanks and lower back bearing large flat warts, that of venter coarsely areolate; no dorsolateral folds; sinuous paravertebral folds sometimes evident; (2) tympanum prominent, 28-52% eye length; (3) snout short, round in dorsal view, round to feebly sloping in lateral profile; lips flared posteriorly; (4) IOD broader than upper eyelid; indistinct cranial crests present; frontoparietal fontanelle not exposed; (5) vomerine odontophores small, oblique; (6) males lack vocal sac and slits; no nuptial pad on thumb; (7) first finger shorter than second; digital pads small to moderate in size (Fig. 4), bearing discs on ventral surfaces; (8) fingers bear prominent lateral fringes; (9) no distinct ulnar tubercles; (11) two metatarsal tubercles, inner oval, 5-7 times size of round outer; plantar surface areolate; (12) toes bear prominent lateral fringes, also present on inner edge of I and outer edge of V; (13) dorsum reddish-brown with darker markings (interorbital bar, scattered blotches on dorsum, suggestions of limb bars); throat brown with darker brown flecks; venter white with brown spots and reticulation; concealed surfaces of hind legs brown with clear spots; normally no canthal-supratympanic stripes or labial bars; (14) adults moderate sized, males 25.2-30.2 ($\bar{x} = 26.9$, $N = 17$) mm SVL, females 29.9-37.9 ($\bar{x} = 34.4$, $N = 16$) mm SVL.

Eleutherodactylus racemus is most similar to *E. obmutescens*, *E. simoterus* and *E. thymelensis* (all have large flat warts on the flanks and lower back) but differs from *E. obmutescens* and *E. thymelensis* in having the tympanum visible. *Eleutherodactylus racemus* differs from *E. simoterus* in lacking vocal sac and slits and in having flared lips and longer hind limbs.

Description. Head as broad as body in males and young females, narrower than body in adult females; head broader than long; snout round in dorsal view, round or feebly sloping in lateral profile; nostrils weakly protuberant, directed anterodorsolaterally; canthus rostralis distinct, swollen, straight; loreal region concave, sloping abruptly to lips; lips flared, especially posteriorly (Fig. 4); interorbital space broad, edges of frontoparietals upturned but crests usually not apparent; areas between eyes swollen (due to underlying

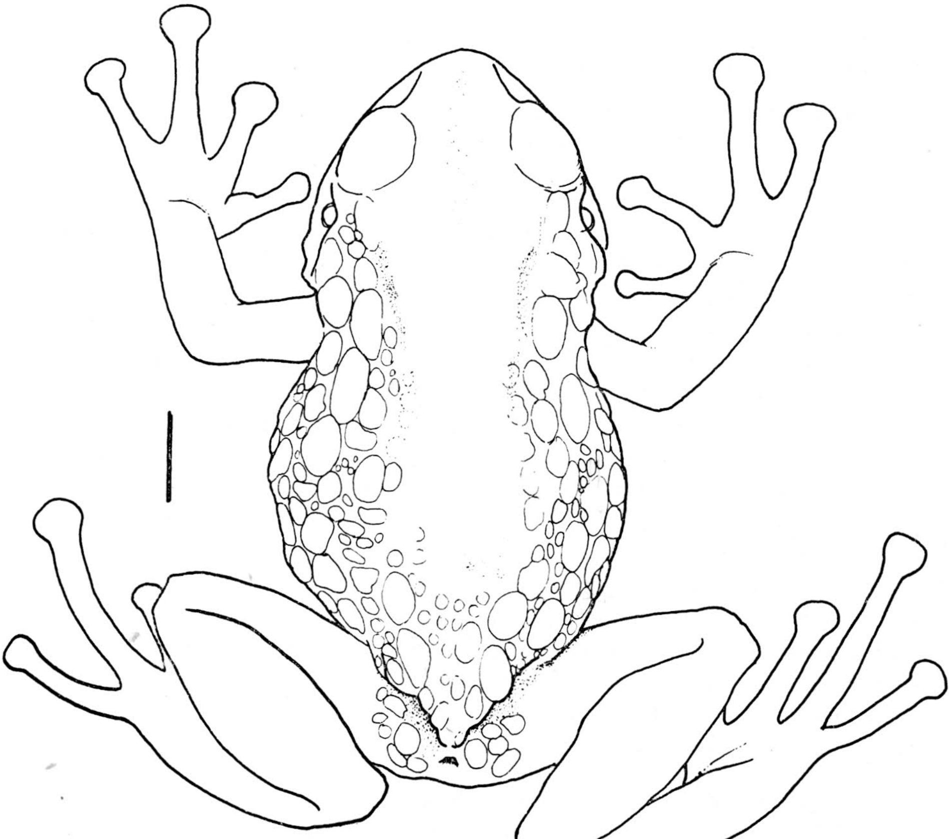

FIGURE 3. *Eleutherodactylus racemus* sp. nov. (KU 168946), showing texture of skin. Scale equals 5 mm.

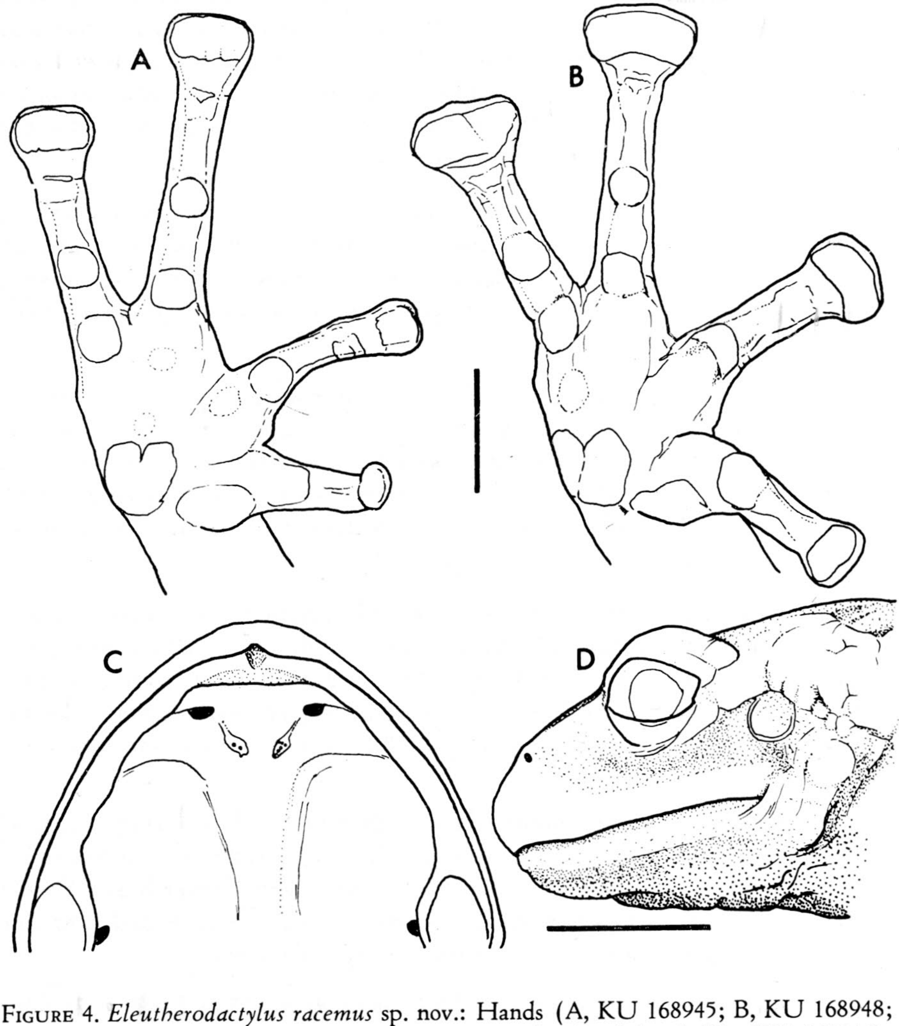

FIGURE 4. *Eleutherodactylus racemus* sp. nov.: Hands (A, KU 168945; B, KU 168948; scale equals 3 mm), palate (C, KU 168946), and side of head (D, KU 168944). Scale for CD equals 5 mm.

muscles); supratympanic fold swollen, obscuring upper edge of tympanum; tympanic annulus elevated; tympanum slightly higher than long; tympanum separated from eye by distance equal to its own length (Fig. 4); postrictal tubercles globulose; choanae relatively small, round, not concealed by palatal shelf of maxillary arch; vomerine odontophores oblique (Fig. 4), median and posterior to choanae, widely separated (by distance equal 1½-2 choanal diameters), each bearing 1-3 teeth (slanted row); tongue longer than wide, its posterior border weakly notched; posterior one-half of tongue not adherent to floor of mouth; males lack vocal sac and slits.

Skin of paravertebral areas and flanks bearing large, flat warts (Fig. 3), sometimes forming reverse parentheses in scapular regions; skin in center of back bearing small granulations, that on head and limbs shagreened or smooth; throat, venter, and undersides of thighs coarsely areolate; discoidal folds obsolete; no anal sheath.

Glandular warts on underside of forearm, but no discrete ulnar tubercles; palmar tubercle bifid, slightly larger than oval thenar tubercle; palm bearing low, flat supernumerary tubercles, most indistinct; subarticular tubercles round, elevated; fold along outside of palm; prominent fringes on fingers; discs broad; pads round apically, those of II-IV as large as tympanum; first finger shorter than second; no nuptial pad in males.

Heel tuberculate, tubercles small; tarsus tuberculate on ventral surface, tubercles flat; inner metatarsal tubercle oval, length 1½-2 times width, outer metatarsal tubercle round, subconical, 1/5-1/7 size of inner; plantar surface areolate; subarticular tubercles round, elevated; toes bearing prominent lateral fringes, weakly expanded pads and broad discs; heels of flexed hind legs touch (but do not overlap).

In preservative, reddish-brown above with dark brown markings (interorbital bar, parentheses in scapular region, scattered spots); no canthal-supratympanic stripe or labial or limb bars; throat brown with darker brown flecks; venter dirty white with brown spots and reticulation; anterior and posterior surfaces of thighs brown, nearly always bearing pale spots.

Dimensions of holotype in mm: SVL 33.6; shank 15.8; HW 12.7; head length 9.9; eyelid width 3.0; IOD 4.0; tympanum length 1.3; eye length 3.9; E-N 3.3.

Proportions (as percentages) are as follows: ♂♂ (N = 17) shank/SVL 44.8-48.0 ($\bar{x} = 46.7$), HW/SVL 37.3-41.0 ($\bar{x} = 39.2$), eyelid/IOD 82.9-119.4 ($\bar{x} = 95.5$), tympanum/eye 28.2-51.5 ($\bar{x} = 36.5$), E-N/eye 71.0-93.1 ($\bar{x} = 79.5$); ♀♀ (N = 16) shank/SVL 41.9-53.2 ($\bar{x} = 47.6$), HW/SVL

36.9-43.2 ($\bar{x} = 39.5$), eyelid/IOD 63.6-91.7 ($\bar{x} = 79.1$), tympanum/eye 31.1-45.5 ($\bar{x} = 36.9$), E-N/eye 76.7-102.5 ($\bar{x} = 86.6$).

The most northen known species of the *thymelensis* assembly occurs on the northen and northeastern slopes of the Nevado del Ruiz approximately 160-170 km NNE of the type-locality of *E. racemus*. This species is superficially more like *E. orcesi* Lynch found along the Cordillera Occidental in central Ecuador (Provincia Pichincha to Provincia Bolívar) than *E. obmutescens, E. racemus* and *E. thymelensis*.

Eleutherodactylus simoterus sp. nov.

HOLOTYPE. Adult ♀, ICN No. 759, one of a series collected by Pedro M. Ruiz, 10 agosto 1970.

PARATYPES. ICN 757, 766-70, 772; same data as holotype. UMMZ IJ 6210-11, 40 km NE Manizales, Departamento de Caldas, Colombia, 3.520 m alt. UMMZ IJ 6205, 6207-09, 45 km NE Manizales, Departamento de Caldas, Colombia, 3.900 m alt.

TYPE LOCALITY. Páramo de Letras, páramo-subpáramo, vereda Albania, Municipio de Herveo, Departamento del Tolima, 3.200 m alt. This is also the type locality for *Osornophryne percrassa* (Ruiz-Carranza and Hernández-Camacho, 1976).

ETYMOLOGY. The specific epithet is New Latin, derived from the Greek *simos*, meaning snub-nosed and refers to the short snout of this frog (Fig. 5).

DIAGNOSIS. (1) Skin of dorsum bearing large flat warts, that of venter coarsely areolate; no dorsolateral folds; (2) tympanum distinct, round, 1/3-1/2 eye length; (3) snout short, round in dorsal and lateral profiles; (4) IOD broader than upper eyelid; feeble cranial crests present; (5) vomerine odontophores oblique; (6) males with vocal slits and vocal sac; no nuptial pad on thumb; (7) first finger shorter than second; narrow pads on fingers II-IV, discs broad; (8) fingers bearing prominent lateral fringes; (9) no ulnar tubercles; (10) no tubercles on heel or tarsus; (11) two metatarsal tubercles, inner oval, 5-7 times size of subconical outer; plantar surface areolate; (12) toes bear lateral fringes and small digital pads; (13) dorsum reddish-brown to black without pattern; anterior and posterior surfaces of thighs, groin, concealed shank uniform reddish brown; throat and venter pale reddish-brown; (14) adults moderate-sized, males 22.8-29.0 ($\bar{x} = 26.6$, $N = 6$) mm SVL, females 32.4-37.1 ($\bar{x} = 35.3$, $N = 6$) mm SVL.

Eleutherodactylus simoterus resembles *E. orcesi* but differs in coloration and in having vomerine odontophores. The warts on the body of *E. simoterus* are larger and less conical than those in *E. orcesi*.

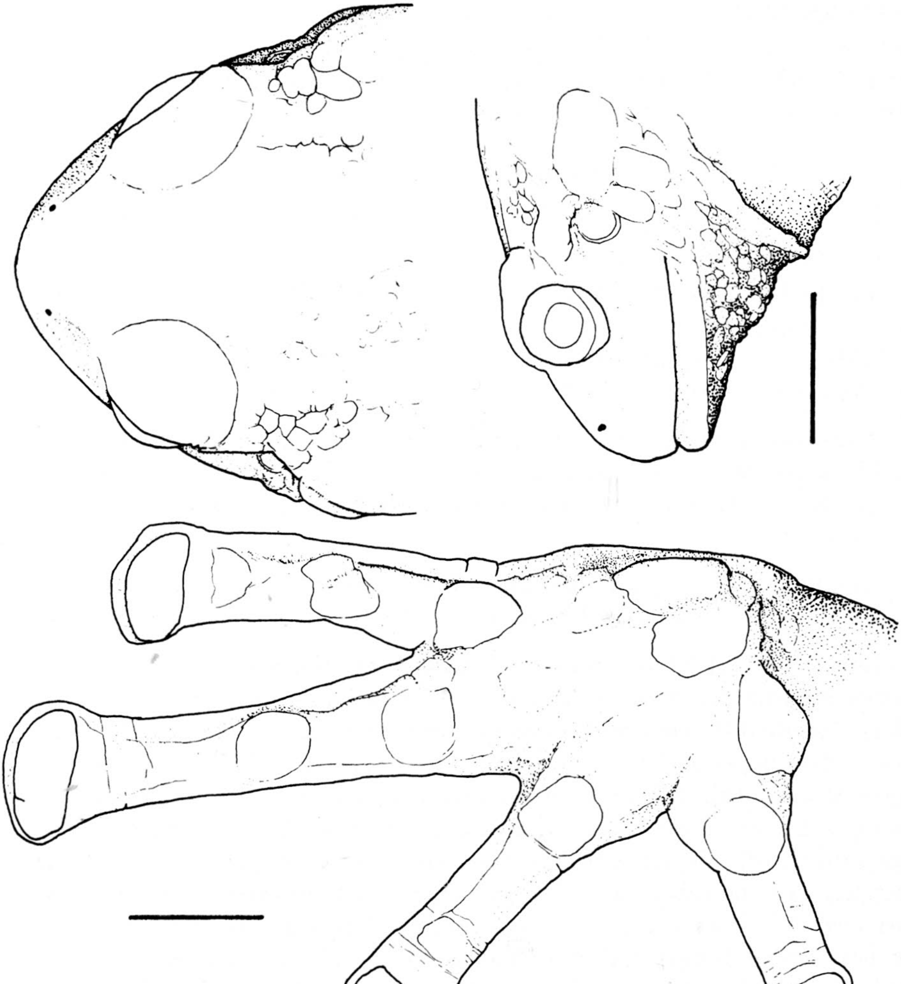

Figure 5. *Eleutherodactylus simoterus* sp. nov. (UMMZ IJ 6207). Scale for hand 2 mm, for head 5 mm.

Description. Head narrower than body, wider than long; snout rounded in dorsal and lateral profile; nostrils not protuberant, directed dorsolaterally; canthus rostralis sharp, straight; loreal region flat, sloping abruptly to lips; lips not flared; interorbital space broader than upper eyelid, edges of frontoparietals weakly upturned; temporal region nearly vertical; supratympanic fold obscure; tympanum distinct, round, separated from eye by its own diameter; choanae small, round, not concealed by palatal shelf of maxillary arch; vomerine odontophores oblique with posterior end roughly triangular in outline, separated medially by distance equal to choanal width, bearing 2-3 teeth along posterior border; tongue longer than wide, posterior one-half not adherent to floor of mouth, posterior edge not notched; males with vocal sac and slits.

Skin of dorsum bearing large flat warts, that of flanks bearing smaller warts; skin of venter and undersides of forearms and thighs coarsely areolate; skin about vent coarsely areolate; anal opening not extended in sheath; no dorsolateral or discoidal folds; dorsal surfaces of limbs smooth; ulnar tubercles not distinguishable; palmar tubercles small, not distinguishable from large supernumerary palmar tubercles, smaller than oval thenar tubercles; supernumerary palmar tubercles conical or low and flattened, both types smaller than round, subconical subarticular tubercles; lateral fringes prominent; fringe extends along outer edge of IV and side of hand; all fingers bearing discs (broader than long); pad on thumb scarcely wider than digit, those on other fingers broader than digit; thumb shorter than second finger; no nuptial pad on thumb of male.

Knee, heel and tarsus lacking tubercles; inner metatarsal tubercle not compressed, 1¼ times as long as wide, 5-7 times size of conical outer metatarsal tubercle; plantar surface areolate, bearing 1-2 supernumerary plantar tubercles at bases of toes II-IV; subarticular tubercles smaller than those of fingers, round, subconical; toes bearing prominent lateral fringes; toes bearing discs (broader than long) on scarcely dilated pads; pads of toes smaller than those of fingers II-IV; heels of flexed hind limbs do not touch; heel of adpressed hind leg reaches region of tympanum.

In preservative, dorsum reddish-brown to black without pattern; ventral surfaces more pale than dorsum; groin, anterior and posterior surfaces of thighs, concealed shank reddish-brown without spots.

Dimensions of holotype in mm: SVL 37.1; shank 16.1; HW 13.7; head length 10.8; upper eyelid 3.9; IOD 3.9; tympanum length 1.5; eye length 4.2; E-N 3.1.

Proportions (as percentages) are as follows: ♂♂ (N = 6) 41.8-46.7 ($\bar{x} = 44.2$), HW/SVL 35.3-40.9 ($\bar{x} = 37.9$), eyelid/IOD 80.0-100.0 ($\bar{x} =$

86.3), tympanum/eye 31.7-40.0 ($\bar{x} = 35.2$), E-N/eye 67.1-79.3 ($\bar{x} = 72.8$); ♀♀ (N = 6) shank/SVL 41.1-46.3 ($\bar{x} = 43.2$), HW/SVL 34.1-36.9 ($\bar{x} = 36.2$), eyelid/IOD 81.1-100.0 ($\bar{x} = 91.6$), tympanum/eye 30.6-49.3 ($\bar{x} = 39.5$), E-N/eye 68.8-84.8 ($\bar{x} = 77.6$).

REMARKS. In spite of its superficial resemblance to *E. orcesi,* I do not consider *E. simoterus* more closely related to *E. orcesi* than to other species of the same series *(E. obmutescens, E. racemus* and *E. thymelensis).* These five species are considered closely related but it is premature to argue which are most closely related within the assembly. At present, each of the five species is allopatrically distributed.

TWO DWARF SPECIES

Goin and Cochran (1963) named the diminutive *Trachyphrynus myersi* on the basis of one adult female from "20 miles east of Pasto, Nariño, Colombia". They compared their new frog with *Crossodactylus* and *Crossodactylodes* but Lynch (1968) argued that *Trachyphrynus* was inseparable from *Eleutherodactylus.* He also referred specimens from Volcán Chiles, Provincia Carchi, Ecuador, to *E. myersi.* The specimens from Ecuador are not conspecific with *E. myersi* and will be described in a forthcoming review of the *Eleutherodactylus* of the northern Andes of Ecuador.

Eleutherodactylus myersi remains an uncommon frog. At present, specimens are known from the Nudo de Pasto and from the eastern slopes of the Páramo de Puracé. Although the species found on Volcán Chiles is not *E. myersi,* it and *E. trepidotus* are closely related to *E. myersi.* Also apparently related to *E. myersi* are two additional dwarf frogs from the Cordillera Central de Colombia. These are described below.

Eleutherodactylus leptolophus sp. nov.

HOLOTYPE. Adult ♀, KU 169041, one of a series collected by William E. Duellman and John E. Simmons, 19 September 1974.

PARATYPE. KU 169034-40, 169042, from the type-locality.

TYPE LOCALITY. 26 km E Puracé, Departamento del Cauca, Colombia, 3.180 m alt.

ETYMOLOGY. The specific epithet is derived from the Greek *leptos* (thin) and *lophos* (crest) in reference to the low dorsolateral folds.

DIAGNOSIS. (1) Skin of dorsum smooth with low warts and short ridges, that of venter areolate; low dorsolateral folds present; (2) tympanum visible, its length 1/3-1/2 eye length; (3) snout short; snout ovoid to subacuminate in dorsal view, round in lateral profile; (4) IOD broader than upper eyelid; no cranial crests; a conical tubercle on upper eyelid; (5) vomerine odontophores absent; (6) males with vocal slits and external, subgular vocal sac; no nuptial pads; (7) first finger shorter than second; moderate-sized pads on fingers II-IV; (8) lateral fringes on fingers; (9) ulnar tubercles elongate; (10) conical tubercles on heel and outer edge of tarsus; short inner tarsal fold; (11) two metatarsal tubercles, inner oval, 3-4 times size of round outer; plantar surface areolate; (12) toes bear lateral fringes, prominent digital pads; (13) brown with darker markings; concealed limbs brown with cream blotches; venter brown with darker blotches; (14) adults small, males 14.3-17.0 ($\bar{x} =$ 15.8, N = 4) mm SVL, two females 22.4-23.2 mm SVL.

Eleutherodactylus leptolophus is most similar to *E. myersi* but differs in having larger digital pads, less prominent inner tarsal fold and outer tarsal tubercles (Fig. 6), and in lacking red spots in the groin. Both differ from the species on Volcán Chiles in having the tympanum exposed.

DESCRIPTION. Head as wide as body, wider than long; snout ovoid in dorsal view (to subacuminate in males), round in lateral profile, deep; nostrils protuberant, directed dorsolaterally; canthus rostralis sharp, slightly concave; loreal region weakly concave, sloping abruptly to lips; lips not flared; upper eyelid bearing one conical tubercle and 2-3 subconical tubercles; interorbital space broad, no cranial crests; supratympanic fold thick, indistinct, obscuring upper and posterior edges of tympanum; tympanum distinct, its annulus raised, round (Fig. 7); postrictal tubercles subconical; palate vaulted; choanae small to moderate-sized, not concealed by palatal shelf of maxillary arch; vomerine odontophores absent, represented in females by oblique keels median and posterior to choanae, no vomerine teeth; tongue longer than wide, its posterior border not notched (or feebly notched), posterior one-half not adherent to floor of mouth; males with long vocal slits lateral to tongue, and a subgular, external vocal sac.

Skin of dorsum smooth with numerous low warts and short, low ridges; low warts more distinct on flanks; a low dorsolateral folds extending from orbit to above groin (indistinct in holotype); conical tubercle above temporal region; anal opening not extended in sheath; venter, throat, undersides of thighs areolate; discoidal folds indistinct; dorsal surface of limbs smooth with some short, low ridges.

Forearm bearing row of elongate ulnar tubercles; a fleshy keel along outer edge of palm (continuous with fringe along outer edge IV); palmar tubercle bifid, larger than oval thenar tubercle; supernumerary palmar tubercles not pungent; subarticular tubercles round, elevated; fingers bearing lateral fringes; pad on thumb scarcely wider than digit below pad, those on II-IV

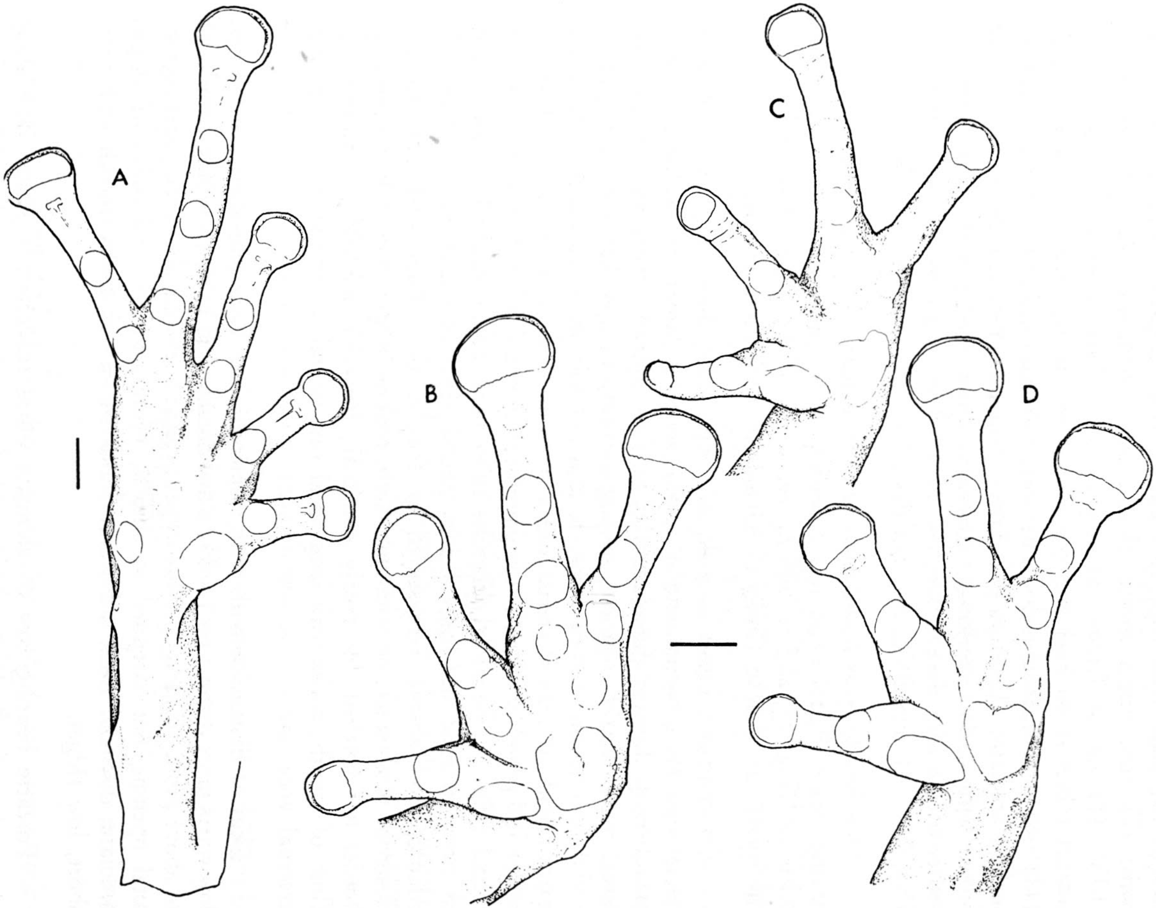

FIGURA 6. (A) Foot and tarsus of *Eleutherodactylus leptolophus* sp. nov. (KU 169041), (B) hand of *E. leptolophus* sp. nov. (KU 169042), (C) hand of *E. myersi* (AMNH 86752), and (D) hand of *E. peraticus* sp. nov. (KU 168919). Scales equal 1 mm.

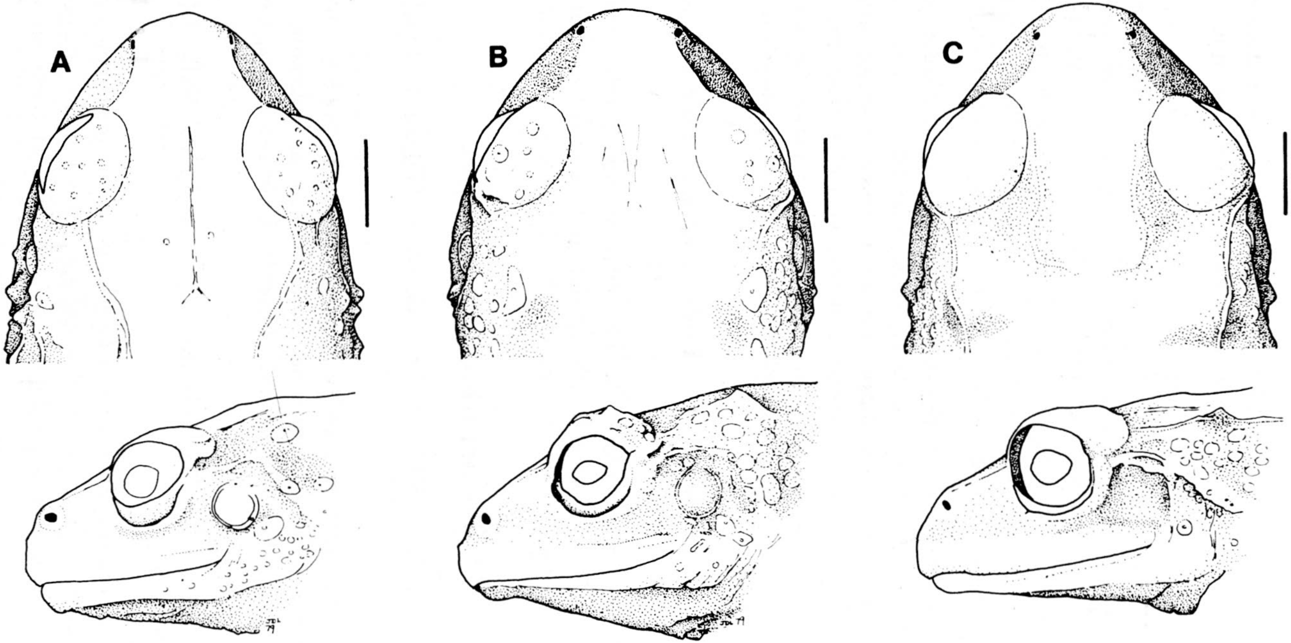

FIGURE 7. Dorsal and lateral profiles of heads of (A) *Eleutherodactylus myersi*, AMNH 86752 (dorsal) and 86753 (lateral); (B) *E. leptolophus* sp. nov., KU 169042; and (C) *E. peraticus* sp. nov., KU 168917. Lines equal 2 mm.

broader; pads round, those of III-IV as large as tympanum; discs slightly broader than long; first finger shorter than second; males lack nuptial pads.

Conical tubercle on heel, two others in row along outer edge of tarsus, replaced on outer edge of sole by fleshy ridge (Fig. 6); very short inner tarsal fold; inner metatarsal tubercle twice as long as wide, not compressed, 3-4 times size of round subconical outer; plantar surface areolate (supernumeraries not distinct); subarticular tubercles round, pungent; toes bearing lateral fringes; toe pads as large as those of fingers, apically round, bearing discs a little broader than long; heels of flexed hind legs overlap slightly.

In preservative, dorsum pale brown with darker brown markings (canthal, supratympanic, dorsolateral stripes, labial bars, limb bars); brown blotches on flanks; anal triangle brown; cream line above anus; posterior surface of thighs brown with (or without) cream blotches; ventral surface brown with indefinite brown blotches; on the lower edge of the posterior surface of the thigh (just proximal to knee) is a colorless area extending length of shank. The testes are white.

DIMENSIONS. (See Table 1). KU 169034 is an adult male 14.3 mm SVL and is not included in the table.

On the Páramo de las Hermosas, Duellman secured another diminutive leptodactylid. This frog is superficially similar to *E. leptolophus* but differs in several profound respects. In allusion to those differences, it is here named,

Eleutherodactylus peraticus sp. nov.

HOLOTYPE. Adult ♀, KU 168915, obtained by William E. Duellman, 4 June 1975.

PARATYPES. KU 168914, 168916; same data as holotype. KU 168917-29, 13 km NE Tenerife, Departamento del Valle del Cauca, Colombia, 3.310 m alt. KU 168930-32, 168939, 15 km NE Tenerife, Valle del Cauca, Colombia, 3.460 m alt.

TYPE LOCALITY. 7 km NE Tenerife, Departamento del Valle del Cauca, Colombia, 2.850 m alt.

ETYMOLOGY. The specific epithet is Greek *(peratikos)*, meaning strange or unusual in allusion to the presence of vocal apparatus but the absence of an ear and to the presence of large digital pads and cranial crests on so small a frog.

DIAGNOSIS. (1) Skin of dorsum finely shagreened with warts and ridges on lower back, that of venter areolate; thin dorsolateral folds present; (2)

tympanic annulus and *cavum tympanicum* absent; (3) snout short; snout subacuminate to subovoid in dorsal view, angularly rounded in lateral profile; (4) IOD broader than upper eyelid; low cranial crests evident; (5) vomerine odontophores present, oblique; (6) males with vocal slits and subgular vocal sac; no nuptial pad; (7) first finger shorter than second; fingers II-IV bearing broad pads; (8) fingers bear lateral fringes; (9) ulnar tubercles elongate; (10) small conical tubercles on heel and outer edge of tarsus; short inner tarsal fold present; (11) two metatarsal tubercles, inner oval, at least 8 times size of elongate outer; plantar surface areolate; (12) toes bear lateral fringes and large digital pads; (13) dorsum brown with no markings or ill-defined markings; venter cream brown spots or reticulation; throat brown in males, cream in females; anterior and posterior surfaces of thighs cream with brown spots; (14) adults small, males 15.3-18.3 ($\bar{x} = 16.9$, $N = 9$) mm SVL, females 20.7-26.0 ($\bar{x} = 23.0$, $N = 8$) mm SVL.

At present, *E. peraticus* appears most similar to *E. leptolophus* but differs in lacking a tympanum and in having cranial crests and vomerine odontophores (Fig. 7).

DESCRIPTION. Head wider than body (males) or narrower than body (females); head wider than long; snout subovoid to subacuminate in dorsal view, angularly rounded to slightly sloping in lateral profile, deep; nostrils protuberant, directed dorsolaterally; canthus rostralis marked but not sharp, straight or slightly concave; loreal region weakly concave, sloping abruptly to lips; lips not flared; upper eyelid bearing one subconical tubercle (well lateral on eyelid); interorbital space broad, edges of frontoparietals upturned producing shield (most evident in large females); supratympanic fold thin, obscured by tubercles on side of head; postrictal tubercles usually conical; tympanum absent (Fig. 7); palate vaulted; choanae moderate-sized, not concealed by palatal shelf of maxillary arch; vomerine odontophores present, minute in males, small in females, lying between and posterior to choanae, oblique, separated on midline by distance equal to 2 choanal diameters, each 1/3 or less size of a choana, bearing 2-3 teeth in slanted row; tongue large, longer than wide, its posterior border not notched, posterior 1/3-2/5 not adherent to floor of mouth; males with long vocal slits posterolateral to tongue, vocal sac single, median, subgular.

Skin of dorsum finely shagreened with superimposed warts and ridges evident on lower back; a thin dorsolateral fold extends from orbit to above groin, bearing a subconical tubercle above temporal region; below dorsolateral fold skin bearing numerous warts (mostly rounded), blending into areolate skin on lower flanks; skin of upper limb surfaces smooth, but on shank bearing ridge-like warts; no anal sheath; skin on venter and below vent areolate; discoidal folds indistinct or absent.

Forearm bearing a row of 3-4 elongate ulnar tubercles; outer edge of palm bearing fleshy keel; palmar tubercle low, bifid, larger than oval thenar tubercle; supernumerary palmar tubercles low; subarticular tubercles round, not pungent; edges of fingers bearing fleshy folds; all digits bearing round pads, that on thumb smallest (Fig. 6), with broad discs; no nuptial pad in male; thumb shorter than second finger.

A small conical tubercle on heel; two low tubercles along outer edge of tarsus; short inner tarsal fold immediately proximal to inner metatarsal tubercle; inner metatarsal tubercle twice as long as wide, flat; outer metatarsal tubercle elongate, $\frac{1}{8}$ (or less) size of inner; plantar surface areolate, supernumerary tubercles not evident; subarticular tubercles round, low (but more pungent than those of fingers); toes bearing lateral fringes; toe pads (and discs) round, as large as those of fingers; heels of flexed hind legs touch.

Dorsum reddish-brown to gray brown without markings (in KU 168926 the dorsolateral folds are bordered below by a dark brown stripe); canthal and labial markings ill-defined; supratympanic stripe dark brown; shank bars narrow, oblique; flanks, groin, anterior and posterior surfaces of thigh, and ventral surface of shank cream with brown spots (sometimes forming loose reticulation), in some males no spotting is evident; throat brown (most males) to cream (most females); venter variously pigmented (cream with discrete dark brown spots to cream with diffuse brown reticulation to brown with indefinite slate gray reticulation); underside of thighs colored as venter.

Dimensions of holotype in mm: SVL 24.8; shank 11.3; HW 9.4; head length 8.5; upper eyelid 2.1; IOD 3.3; eye length 3.1; E-N 2.2.

Proportions (as percentages) are as follows: ♂♂ ($N = 9$) shank/SVL 42.0-50.0 ($\bar{x} = 45.5$), HW/SVL 34.5-38.2 ($\bar{x} = 36.6$), upper eyelid/IOD 64.0-100.0 ($\bar{x} = 76.2$), E-N/eye length 65.4-90.5 ($\bar{x} = 79.6$); ♀♀ ($N = 8$) shank/SVL 42.7-48.8 ($\bar{x} = 44.9$), HW/SVL 35.8-39.2 ($\bar{x} = 37.5$), upper eyelid/IOD 63.6-80.4 ($\bar{x} = 75.0$), E-N/eye length 71.0-92.3 ($\bar{x} = 78.5$).

REMARKS. *Eleutherodactylus peraticus* and *E. leptolophus* are judged closely related (but are obviously different). However, the similarity between the two species is presently phenetic. Both are small frogs with relatively large digital pads and dorsolateral folds. A second complex consists of three other species: *E. myersi* (Goin and Cochran), *E. trepidotus* Lynch, and the undescribed species from Volcán Chiles. These three species have virtually no digital pads although they have discs on the ventral surfaces of the digit tips. Vomerine odontophores are lacking in *E. myersi* and in the species from Volcán Chiles whereas they are present but concealed beneath the tissue of the palate in *E. trepidotus*. None of the three has dorsolateral folds.

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TABLE 1

Dimensions of adults of *Eleutherodactylus leptolophus* sp. nov.

MEASUREMENT	KU 169038 ♂	KU 169039 ♂	KU 169040 ♂	KU 169041 ♀	KU 169042 ♀
SVL	16.8	15.0	17.0	22.4	23.2
Shank length	8.5	7.5	7.8	10.9	11.0
HW	6.1	5.8	6.1	8.7	8.9
Head length	6.0	5.1	5.8	7.9	7.9
Eyelid width	1.6	1.6	2.0	2.3	2.2
IOD	2.4	2.2	2.3	2.7	3.1
Tympanum length	0.85	0.9	0.8	1.3	1.3
Eye length	1.9	2.0	2.3	2.8	2.8
E-N	1.65	1.4	1.9	2.2	2.3

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